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Net Enabled Operations & the Tactical Edge

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Overview

- What does net enablement really mean for tactical systems?
- What is different about the tactical environment?
- How are we going about achieving it?
- What could we do better?
- Our way ahead

Engagement Objectives

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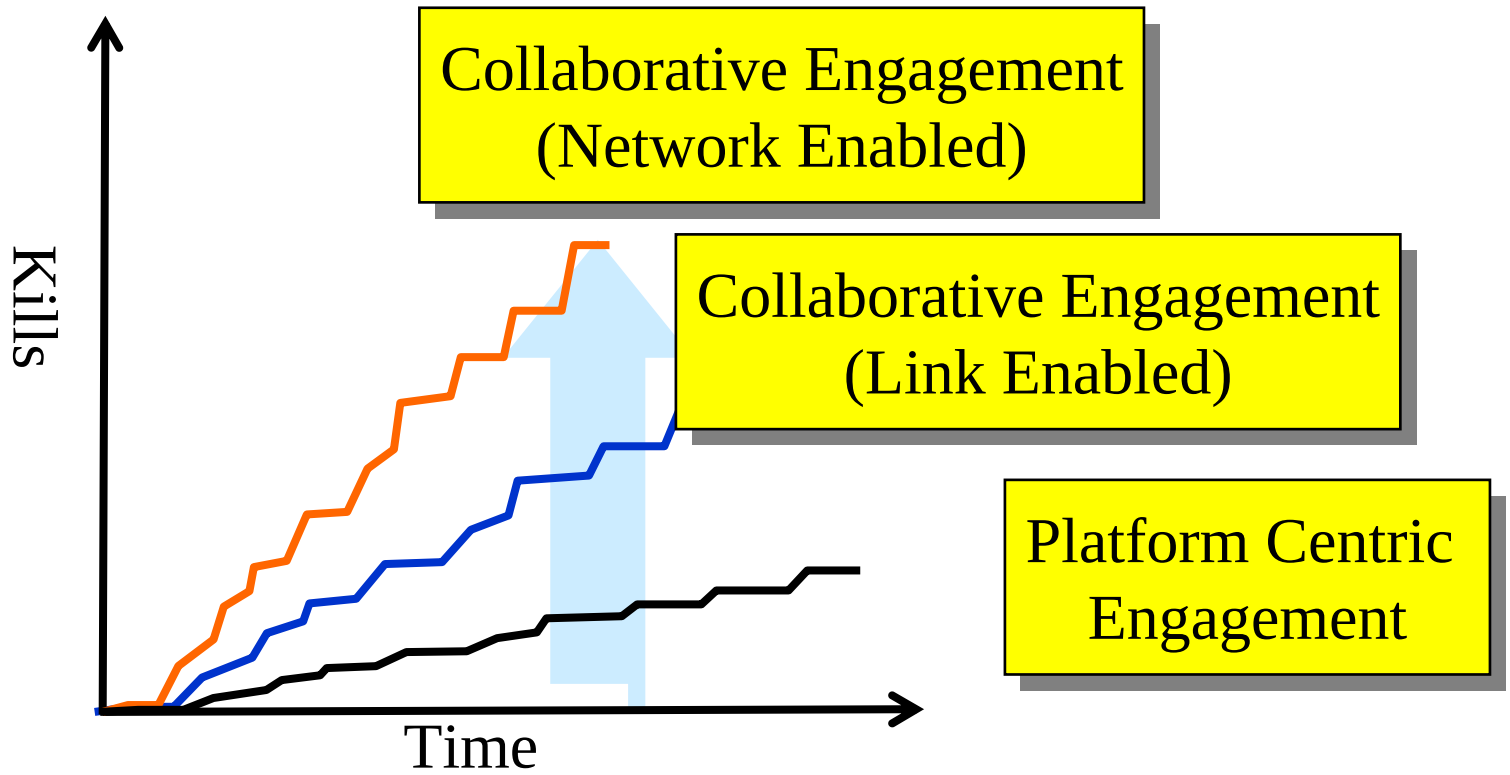

"Enable simultaneous kills of high-value targets, employing a strategy of shock & awe that can bring a situation to conclusion far more rapidly than an attrition based approach" Dr David Alberts, OSD/C3I

Net Ops Example – Networked Joint CAS vs. Mobile Targets

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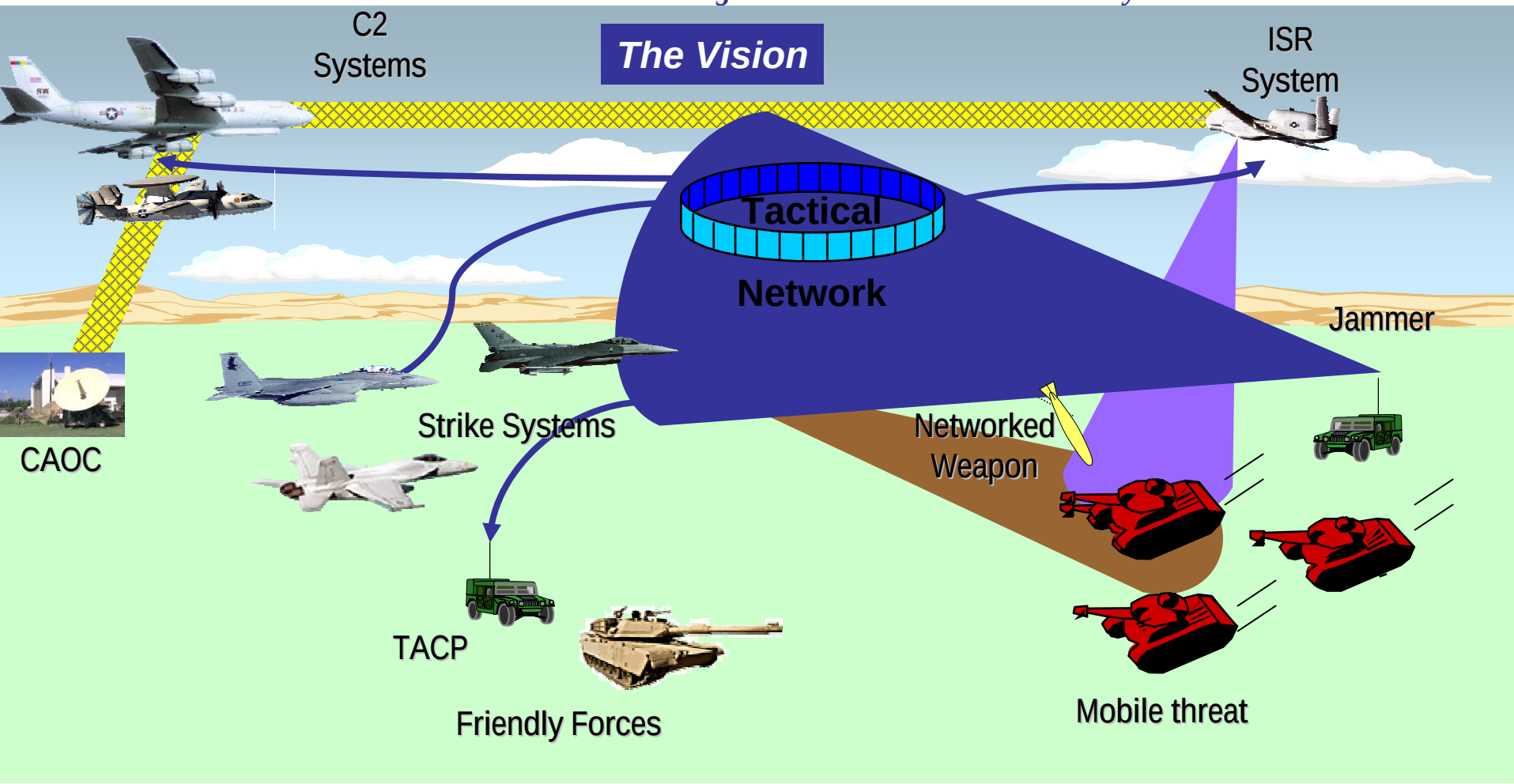

Tight integration of platforms, sensors and weapons enable engagement of moving targets in all weather and permit strike assets to launch at max weapon ranges

Historical Peer Collaboration Development Process

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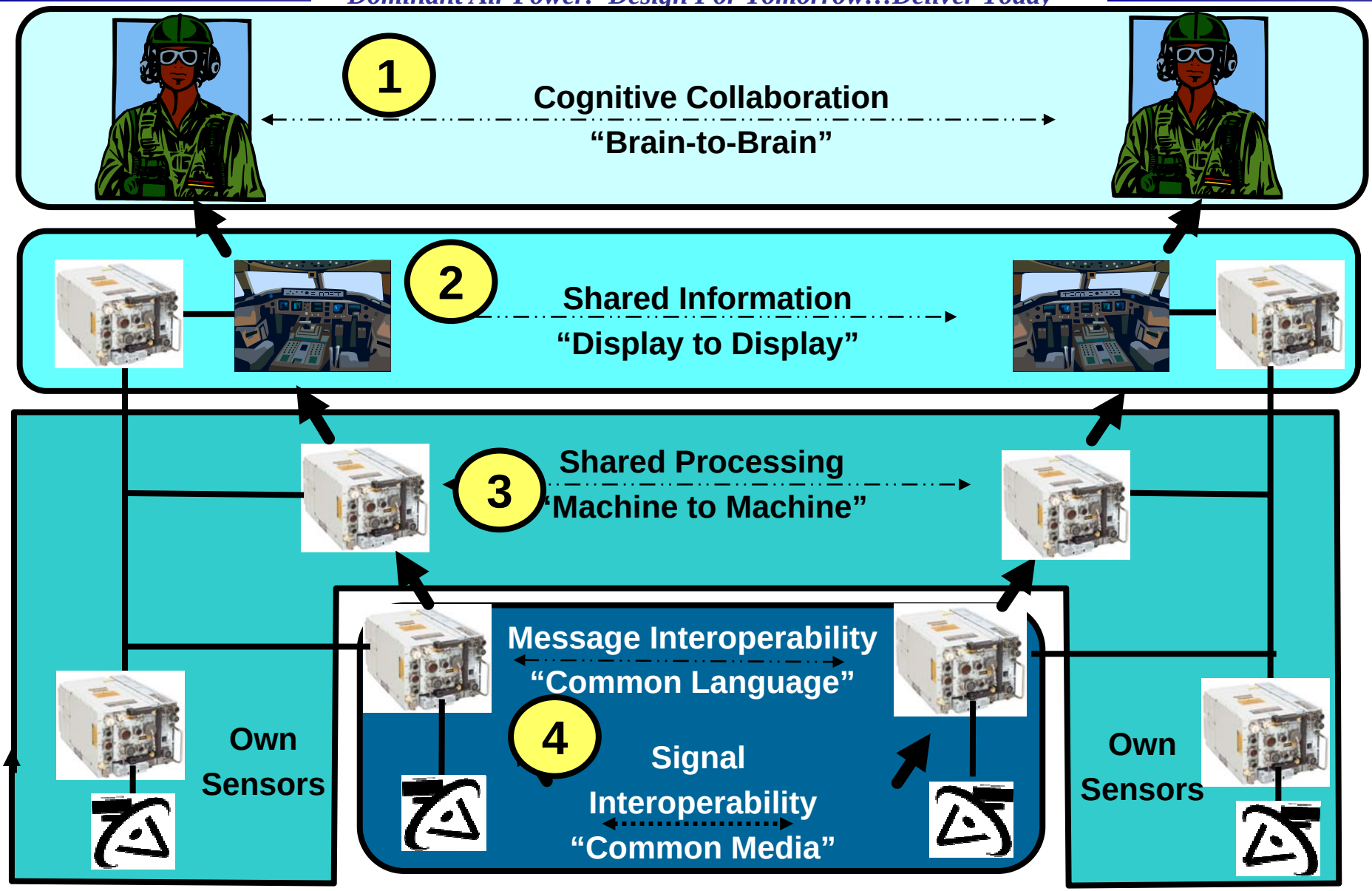

Tactical Collaboration Grid

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Collaboration Reach

Collaboration Richness

	Peers	Strike Package	Ground Engagement Forces	Air Operations Center
Status	Fuel, Weapons Load, Fusing, Own ship position, sensor status, Target Engagement, Call Sign, A/C Type			
Control	Waypoints, Mission Assignment, Target Assignment, Target Sorting, Shoot list coordination			
Awareness	Air/Ground Track Transmit/Receive, Common Reference System Receive Imagery Transmit/Recevive			
Correlation	Post Launch Weapon Control, Target Geolocation Sensor Correlation, Correlated ATR/GMTI			

Current Fielded Strike Platforms

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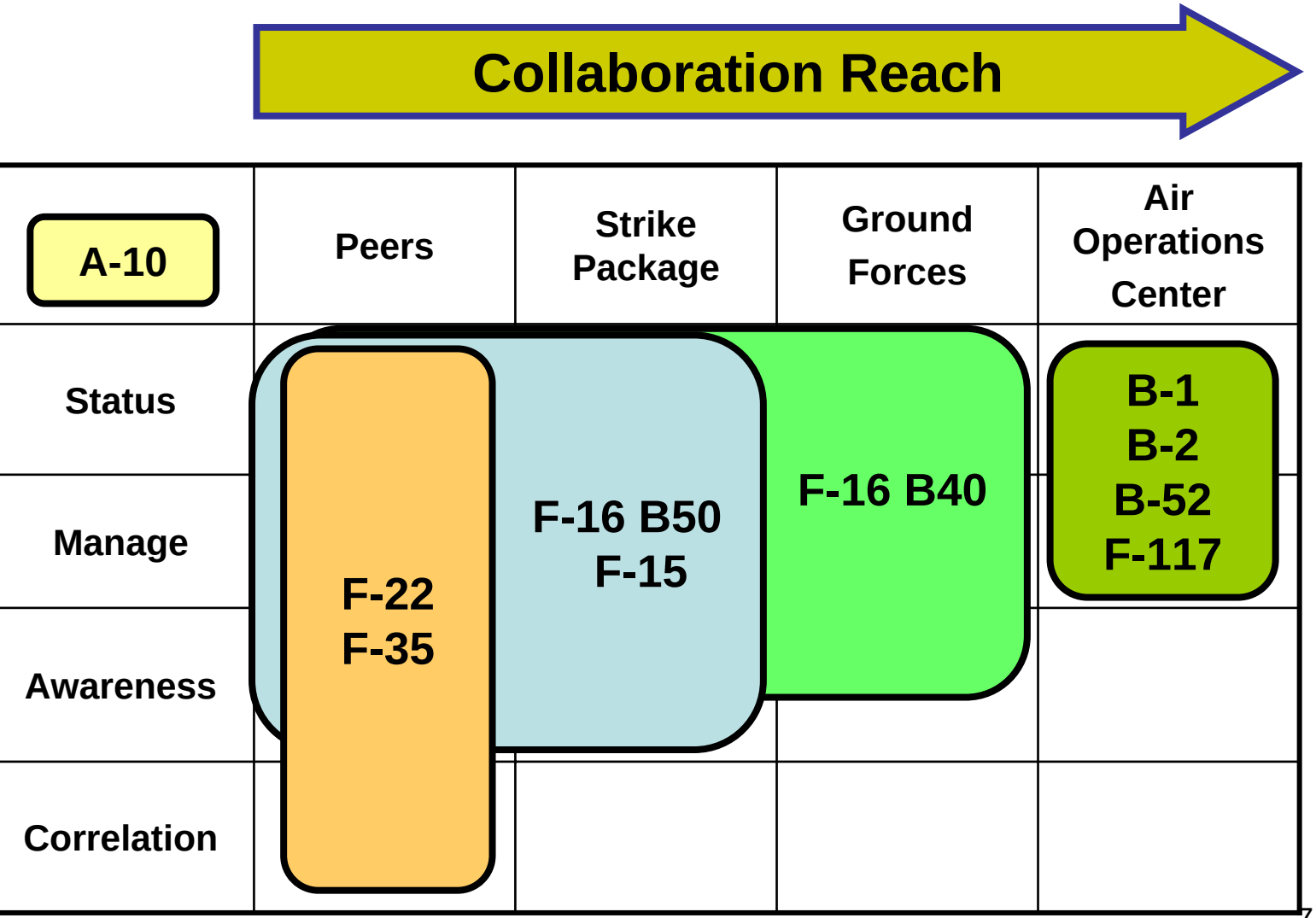

Collaboration Grid

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Collaboration Reach

Collaboration Richness

	Peers	Strike Package	Ground Forces	Air Operations Center
Status	?	?		?
Control			?	
Awareness		?		
Correlation	?		?	

Problem
Air Threat example

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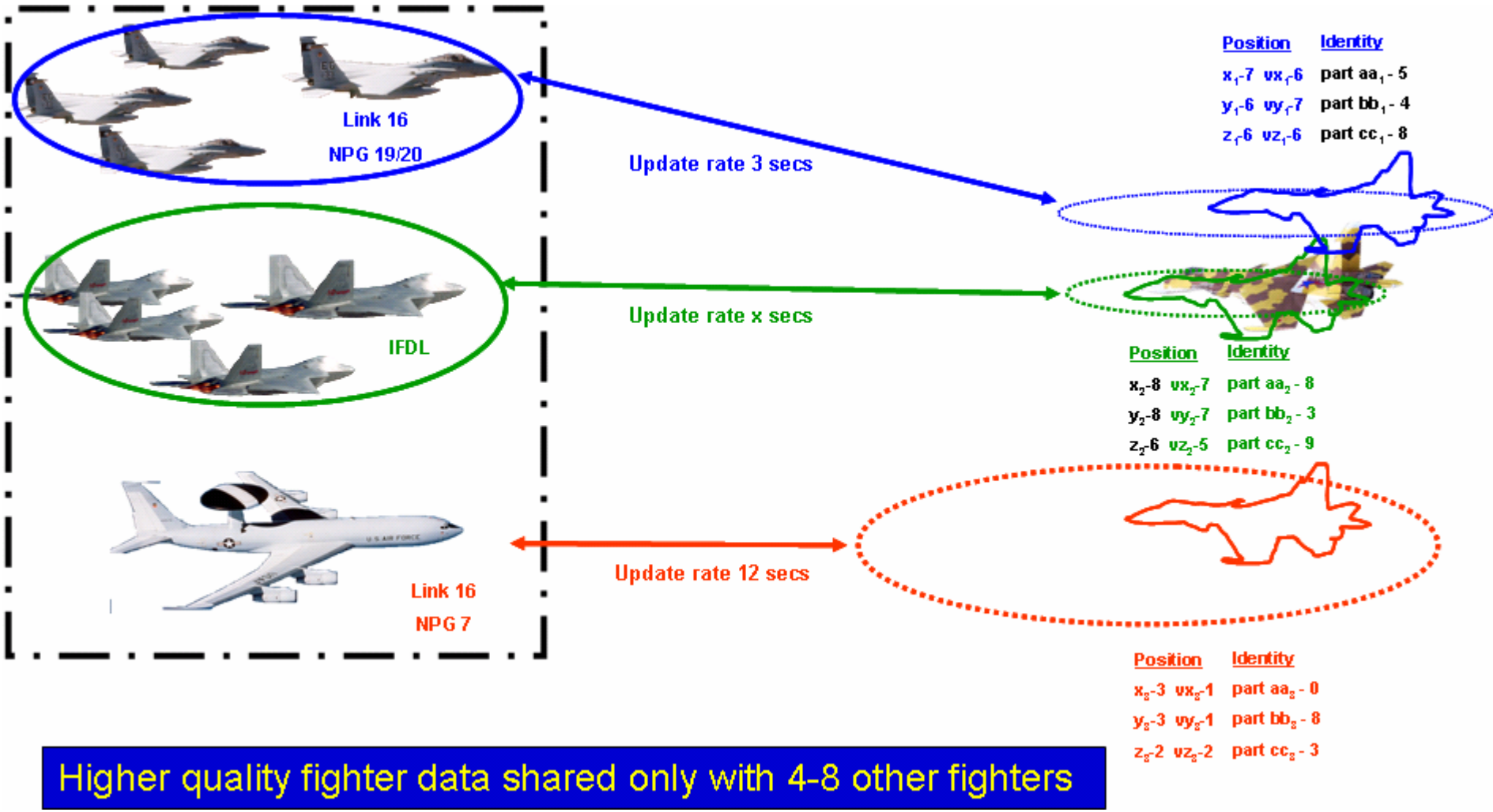

Higher quality fighter data shared only with 4-8 other fighters

Problem
Ground Threat example

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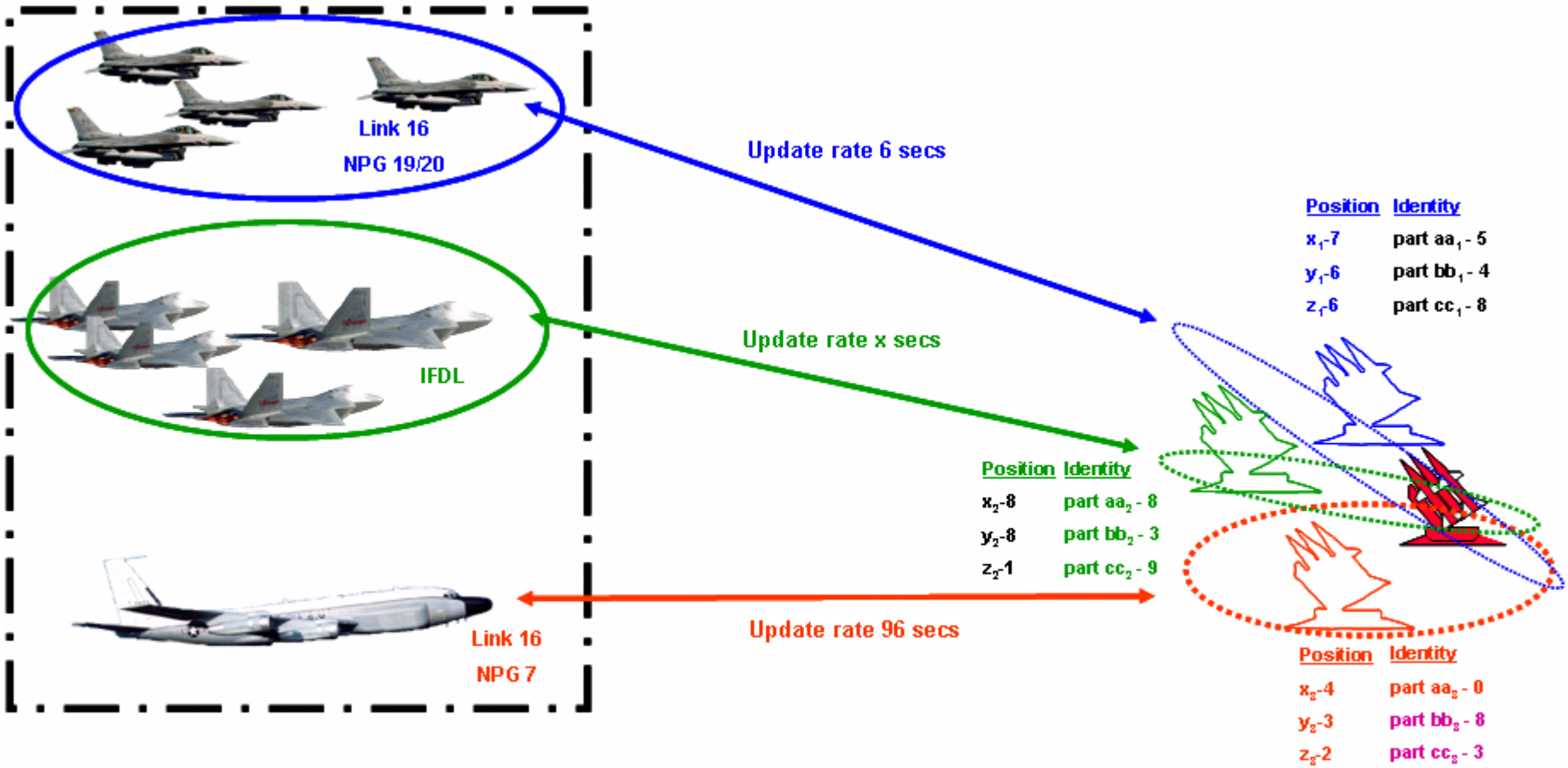

Higher quality fighter data shared only with 4-8 other fighters

Current Airpower Management

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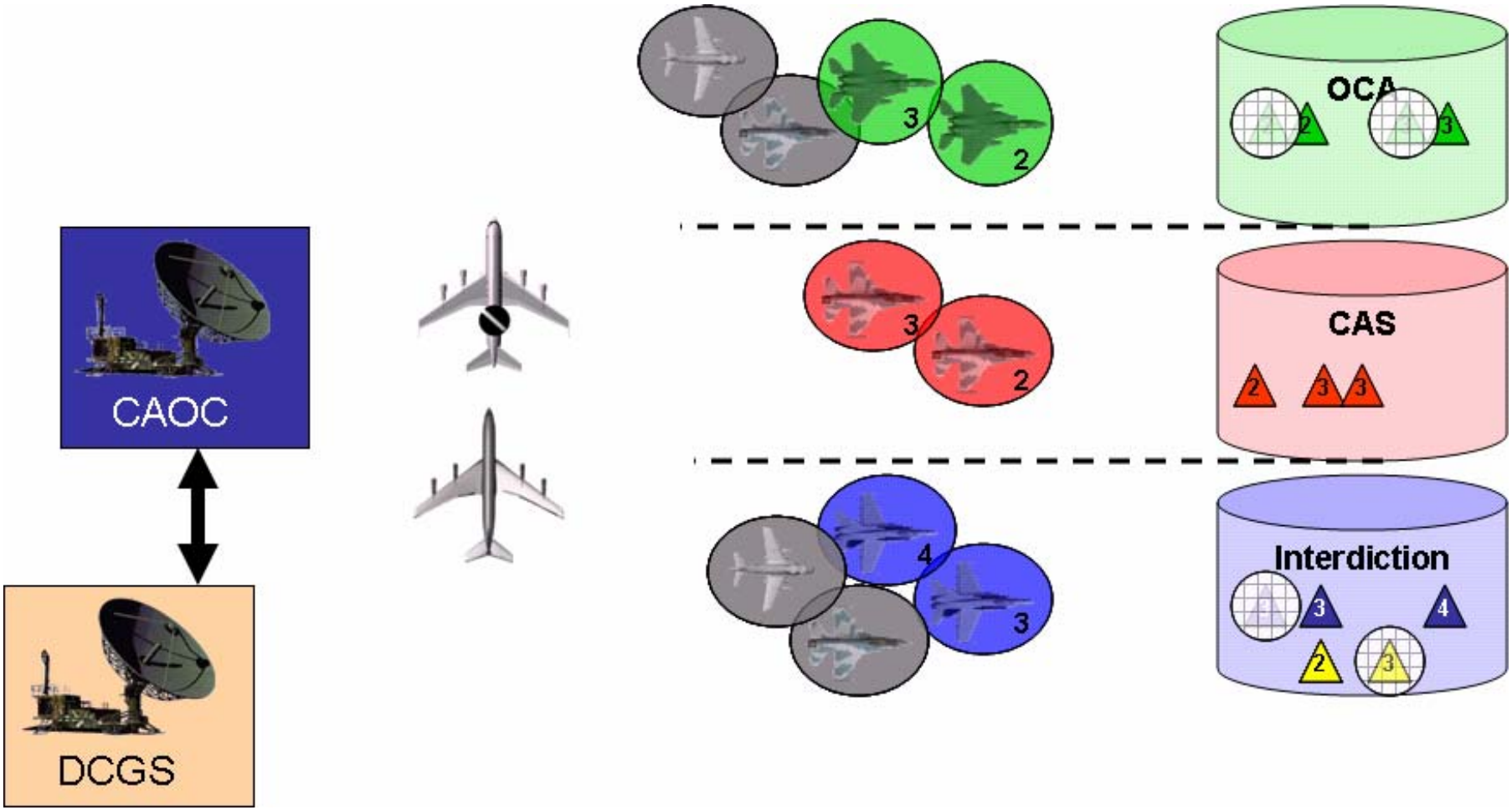

Current Airpower Management

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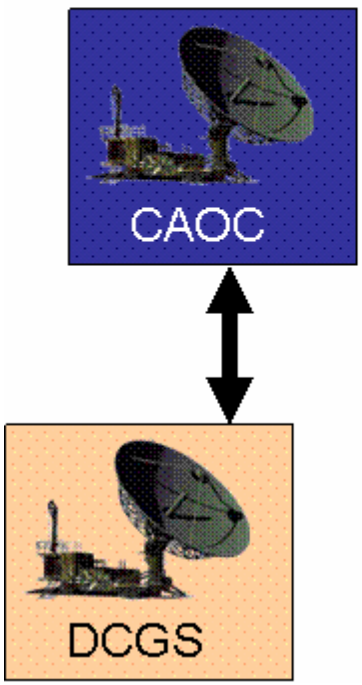

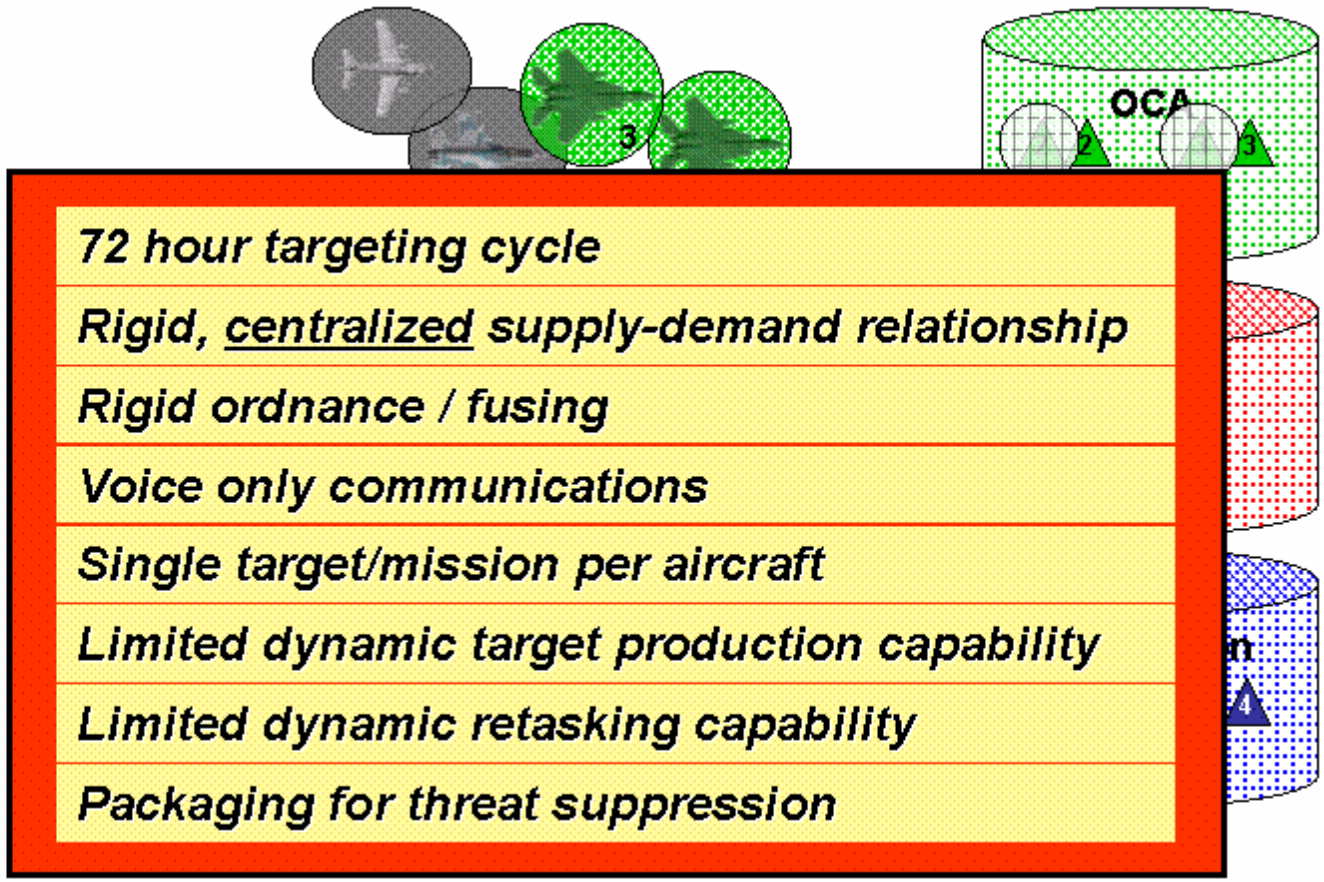

- *72 hour targeting cycle*
- *Rigid, centralized supply-demand relationship*
- *Rigid ordnance / fusing*
- *Voice only communications*
- *Single target/mission per aircraft*
- *Limited dynamic target production capability*
- *Limited dynamic retasking capability*
- *Packaging for threat suppression*

Proposed Improvement to Airpower Management

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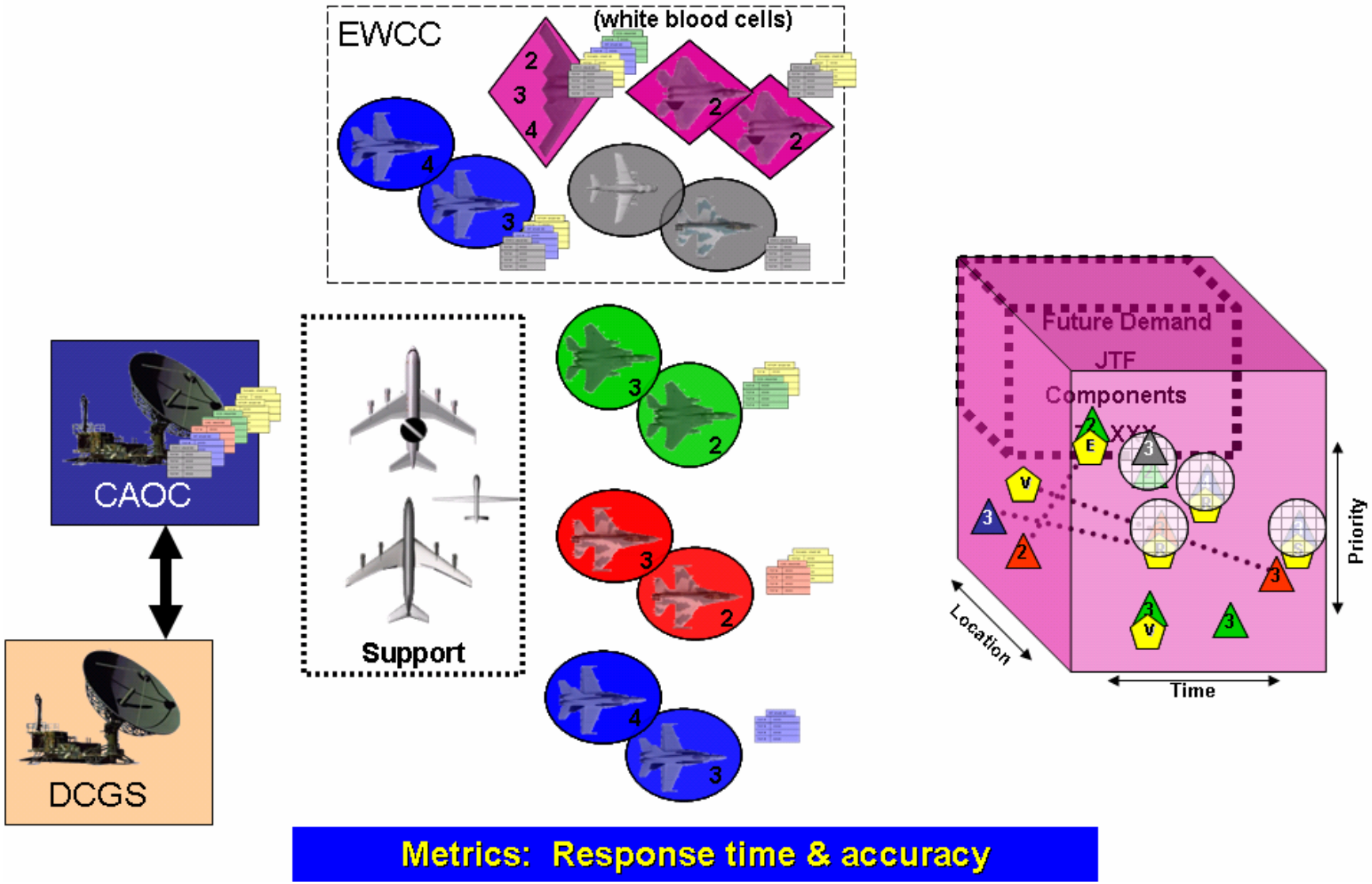

Metrics: Response time & accuracy

Proposed Improvement to Airpower Management

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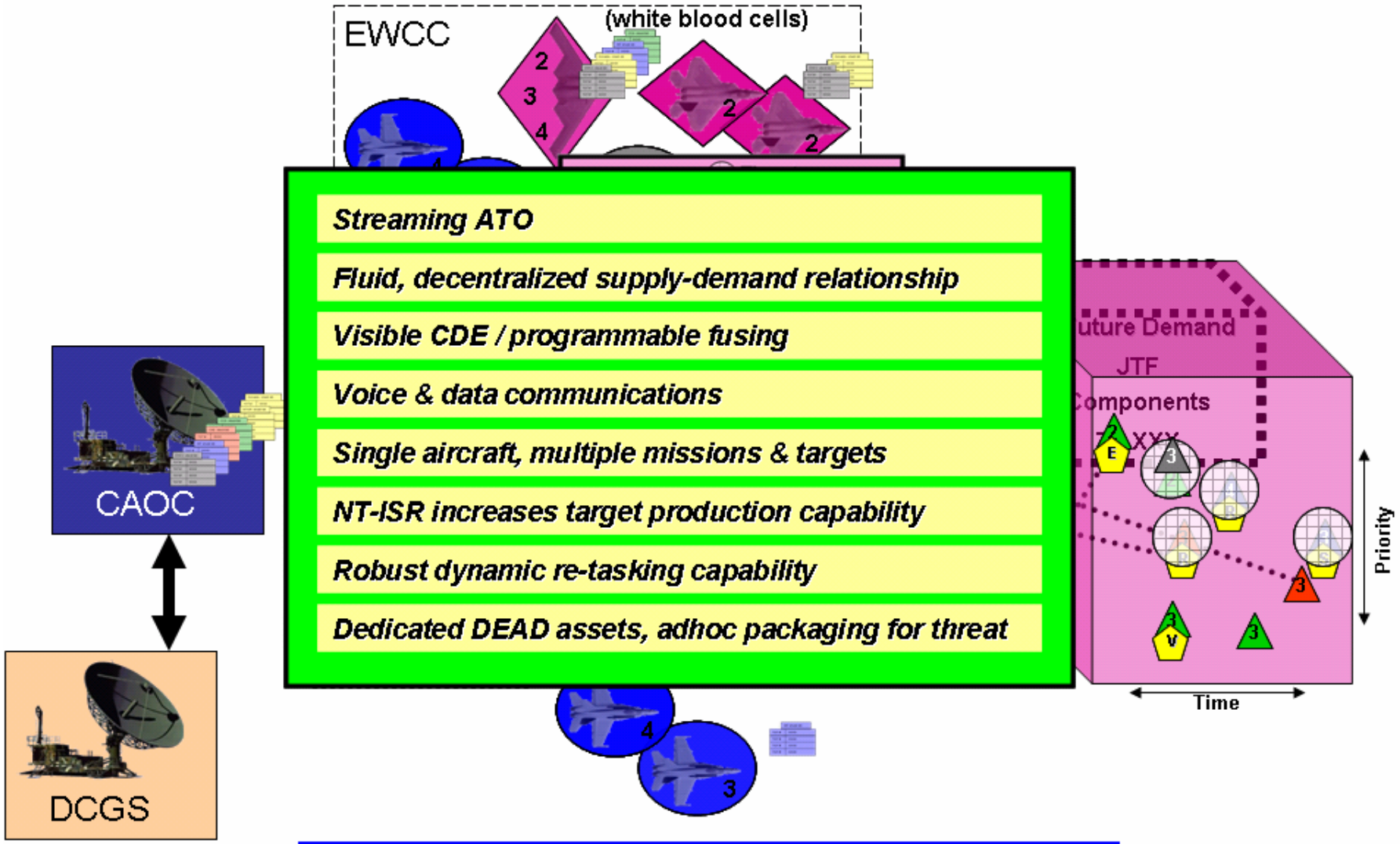

Metrics: Response time & accuracy

Weapon Control System Perspective

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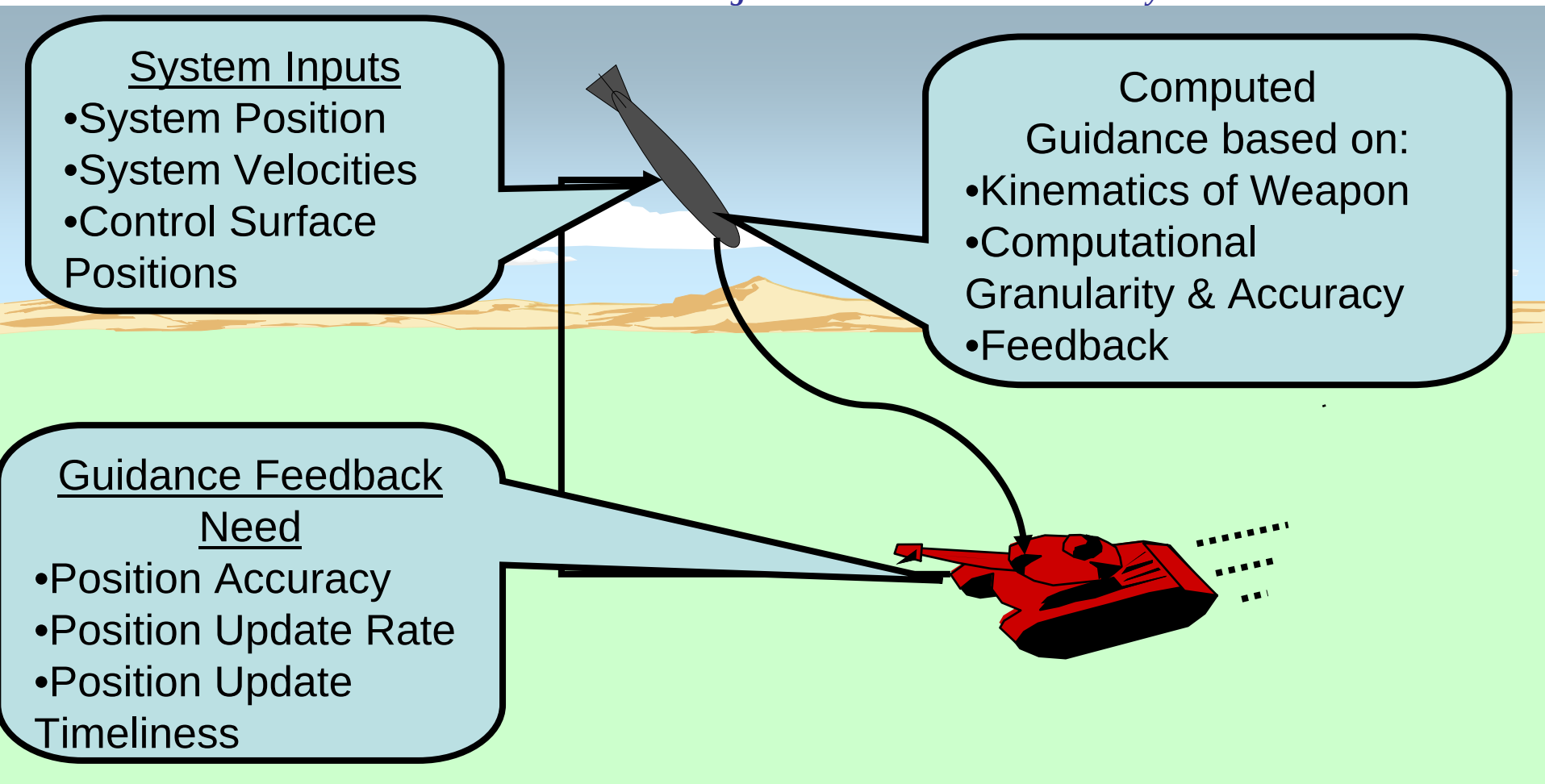

Weapon designer is interested in maximizing kill rate based on maximum kinematics capability of the weapon and maximum target information to deploy that capability

Overview

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Operational Context Drivers for Capabilities

- Vehicle operational envelopes
  - High (3+)mach, G(9+), high roll rates, high closure rates
- Physical environments
  - Day/night, clear/obscured operations
  - Close surface, high altitudes, terrain/sea effects
- Threat environments
  - Active/passive jamming
  - System detection & vulnerability
  - Known & pop-up threats
- Mission package dynamics
  - Dynamic mission package participation
  - Varied mission package quantities & connection ranges
  - Concurrent operation with layered with other communication media/methods
  - Small to large mission packages, small to large theatres of operations
- Next generation collaborative techniques
  - Information timeliness, integrity, duration, & data rates

Network Performance & Force Application Collaboration

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- Weapons and weapon systems operate in real time with **hard deadlines** and **high integrity**
- Information obtained/transmitted over a network must support these requirements to achieve mission success
- Weapon systems operate in a dynamic resource constrained environment with high threat interaction
- Information transport solutions must support full range of information characteristics
  - Operational **Timeliness**
  - Operational **Quantity**
  - Operational **Range**
  - Operational **Continuity**
  - Operational **Integrity**

Information transport solutions must address full spectrum of information characteristics

Classes of Timeliness

- Hard Real Time – operations require correct information by a specific deadline, or the function will fail
- Soft Real Time – operations desire correct information by a specific deadline – however, the operation can recover and continue to operate if correct information is obtained within a bounded timeframe – if not, the function will fail
- Non Real Time – operations require correct information at whatever time the information is available - % of functional execution is based on available resources

Network Capacity & Utilization By Mission Phase

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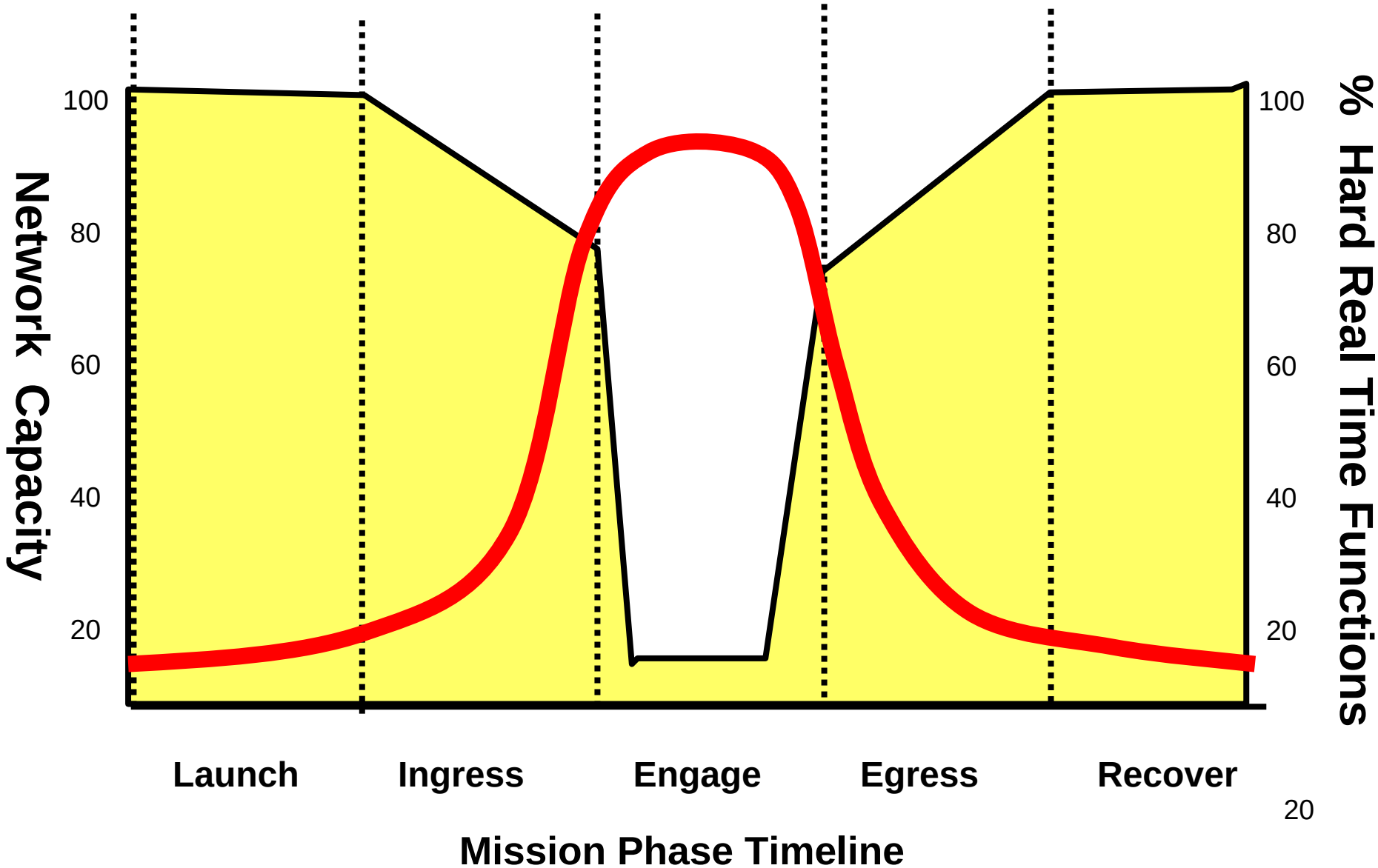

Recent Off-Board Network Assessment

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Attribute	Network A	Network B	TTNT	Network D
Engagement Capabilities				
Engagement Environment				
Threat Environment				
Cost - Legacy Avionics				
Cost - Integrated Avionics				
Schedule Legacy Avionics				
Schedule Integrated Avionics				

Recent On-Board Network Assessment

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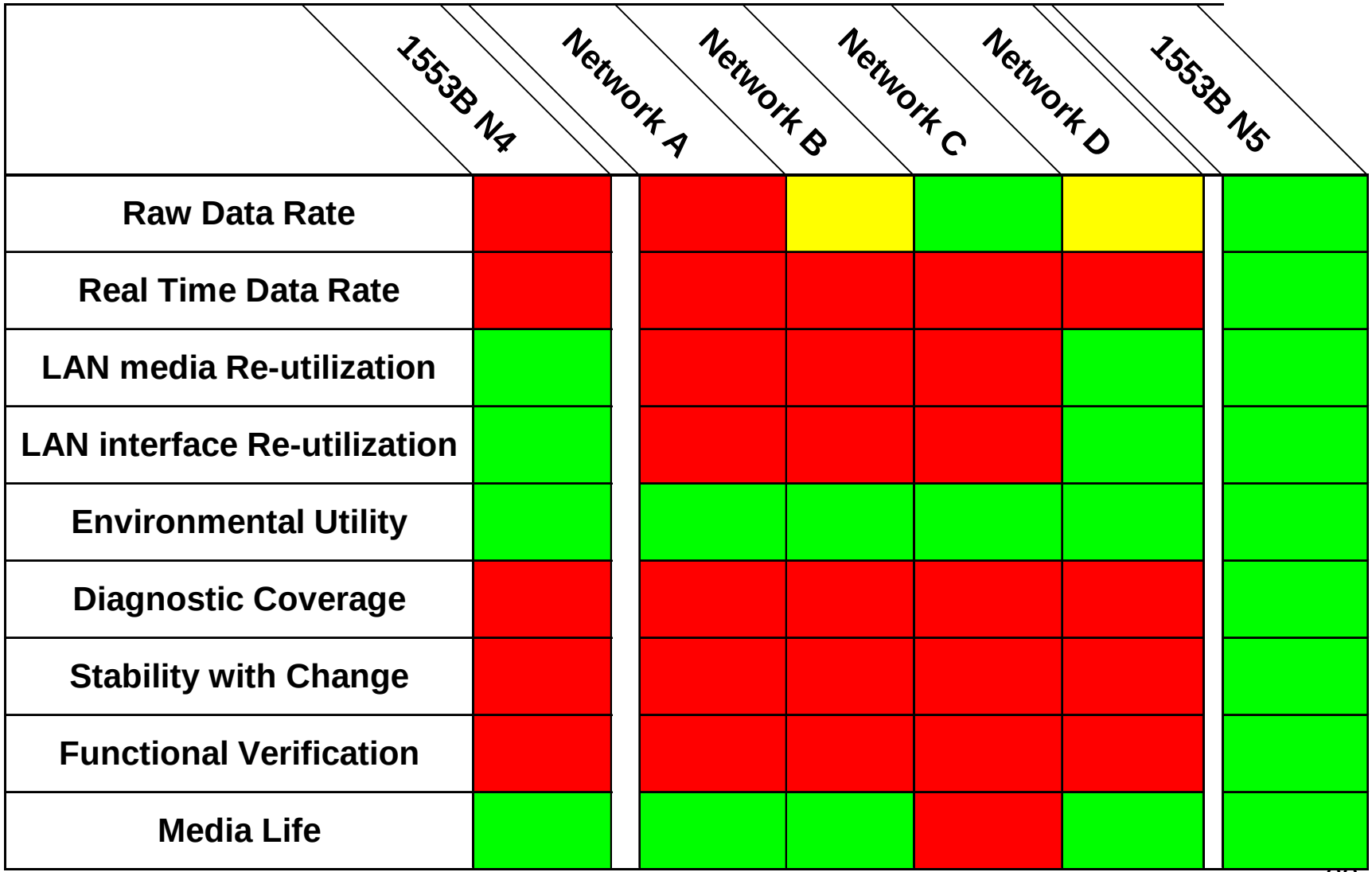
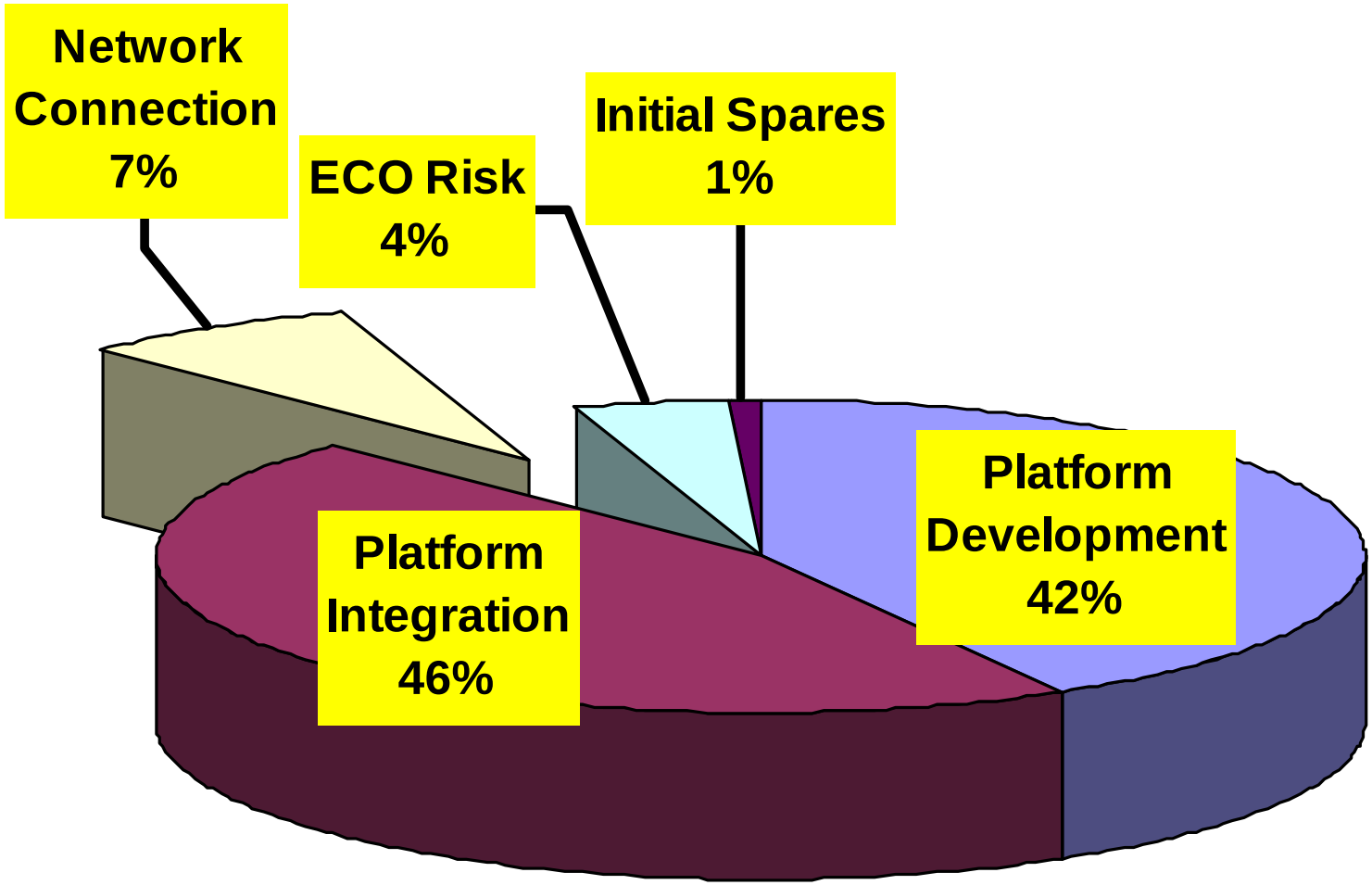


Aircraft Weapon System Cost For Network Enablement



Overview

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Today's Deployment Environment

- **Numerous solutions for current and future net enabled effects are being directed to individual weapon systems**
- **Candidate selection based on mandated & directed design solutions**
  - Correlation to mission effects not clear
- **Timing & precedence of platform implementations not clear**
  - Correlation to strike packages not clear
- **Insufficient resources to implement all directed solutions**
  - Who has final say on what is implemented not clear
- **Warfighting benefits not clear, deployment coordination not clear**
  - Not sure what net enabled effects will be delivered

Directed Solutions for Net Enablement of Joint CAS Missions

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- **GFE Software based Common Functions**
  - CLIP, SIAP
- **Network Terminal Programs**
  - MIDS/LVT, MIDS/JTRS, AMF JTRS,
  - SADL, BACN, FAB-T, MP-CDL
- **Network Waveforms**
  - WNW, TTNT, CDL, IBS, WDL, IFDL
  - MADL, LINK-16, EPLRS, AFAPD/VMF
- **Interoperability Compliance Programs**
  - 6016C, JTIC, SCA
  - IPv6, Net Centric KPP
  - Net Centric Operations Warfare Model , ISMART
  - Systems Architecting/C2 Constellation/ConstellationNet

The Reality

Direction Independent of Desired Collaboration & Platform Integration

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1

Cognitive Collaboration

"Brain-to-Brain"

2

Shared Information

"Display to Display"

3

Shared Processing

"Machine to Machine"

Message Interoperability

"Common Language"

Signal Interoperability

"Common Media"

Onboard Sensors

Onboard Sensors

Our Concern

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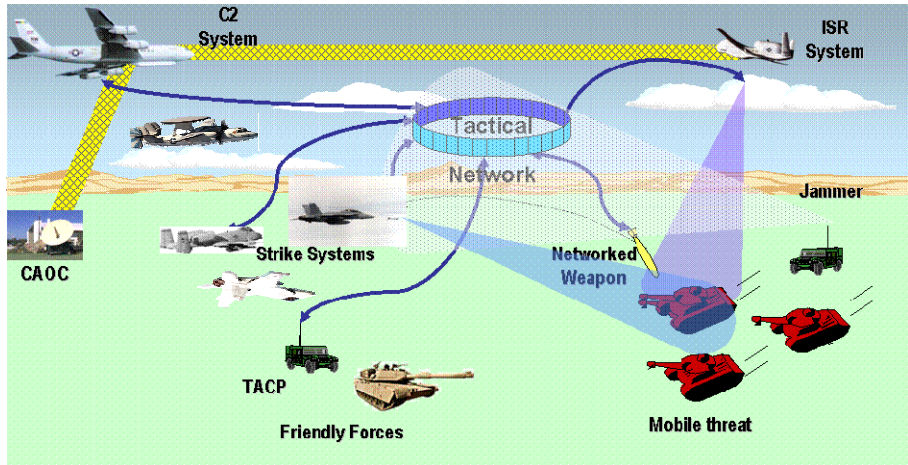

Tight integration of platforms, sensors and weapons enable engagement of moving targets in all weather and permit strike assets to launch at max weapon ranges

Do the solutions equal effects???

(and are they coordinated?)

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Platform Practice

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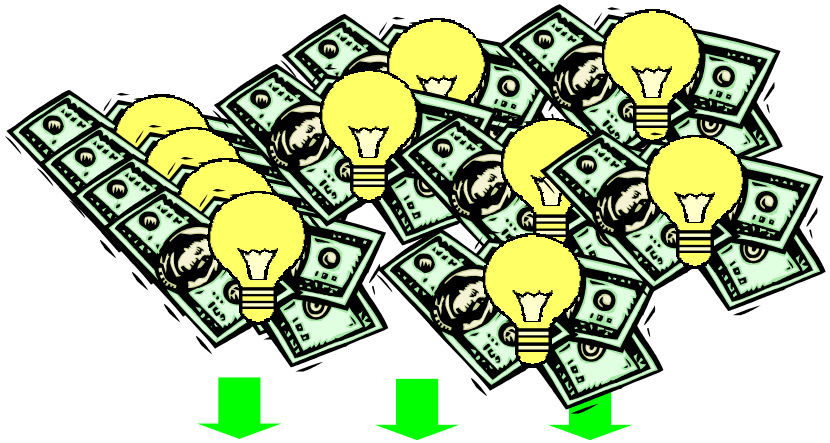
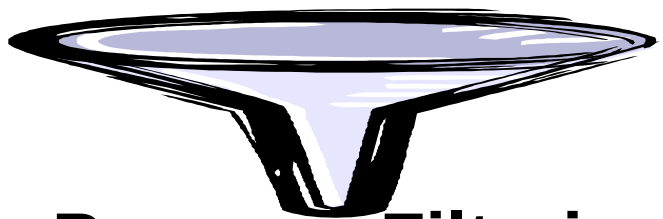
Lots of Great Ideas

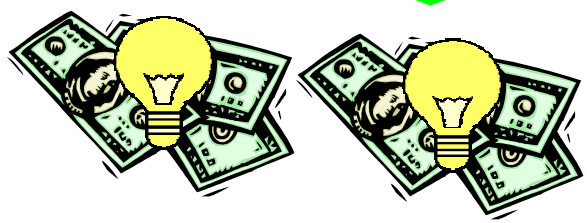


Filtering Funding



Program Filtering

Functional Funding



Funded Capabilities

Platform Filtering Process

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Collect Great Ideas From: Operational Experience, Laboratory/DARPA Programs, AFROC/JROC,MAJCOM, Contractors

Identify desired operational utility & benefits for each candidate

Develop initial solutions for each candidate & implementation strategies

Conduct analysis in mission context determine predicted mission benefits

Weigh candidates, benefits & implementation costs

Select candidates constrained by limited resources

Historical Peer Collaboration Environment

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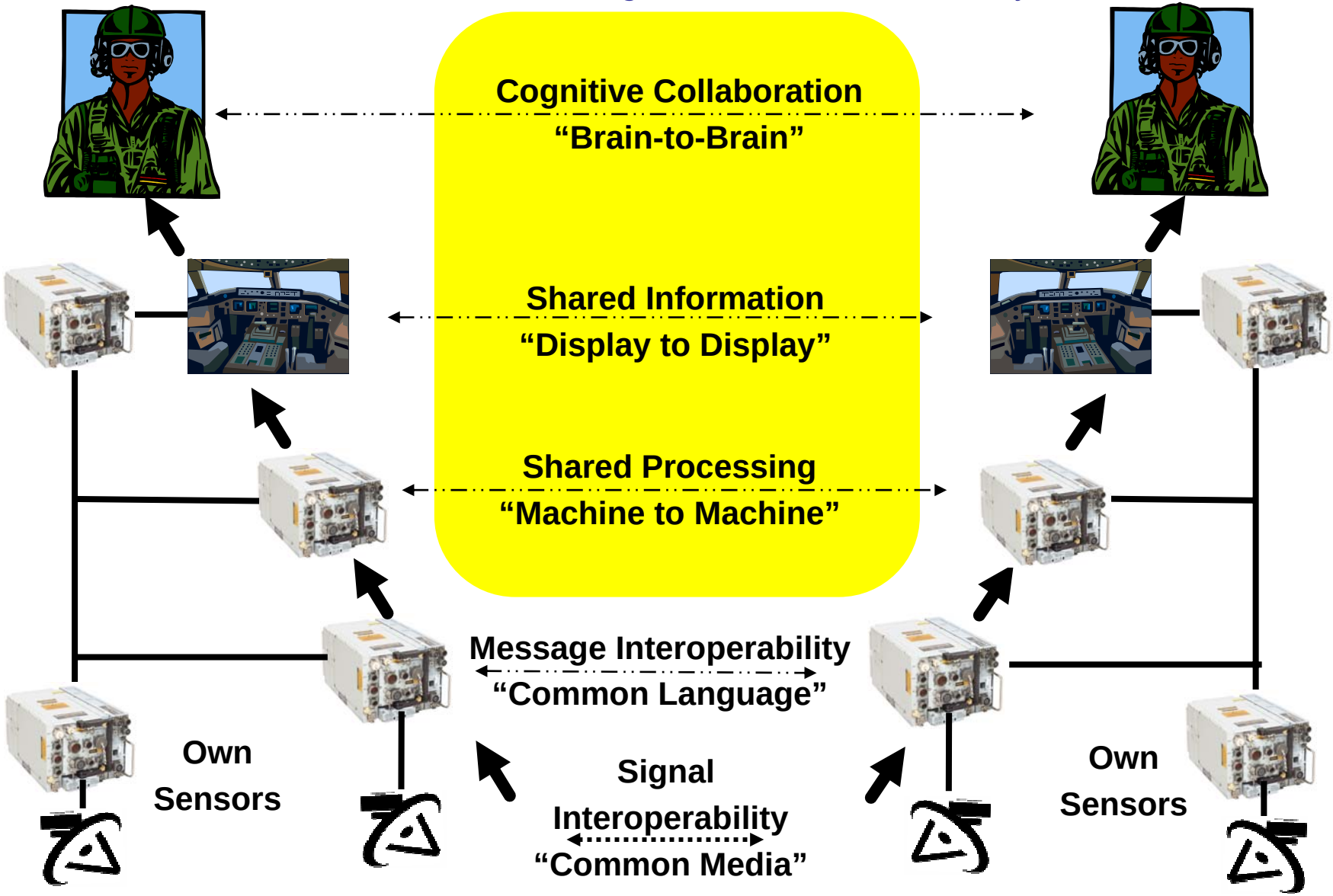
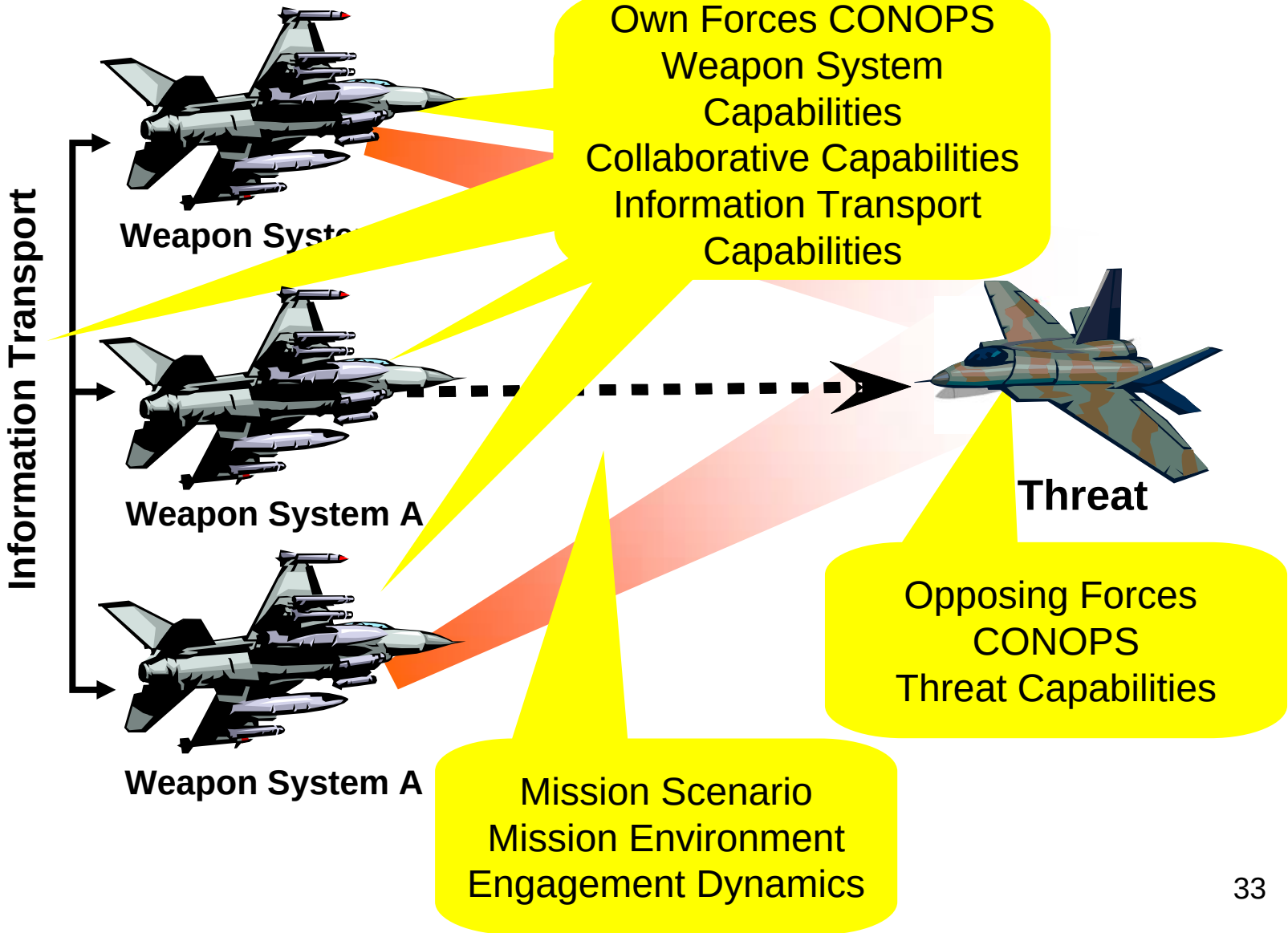


Collaborative Engagement Effectiveness Determination



Peer Collaborative Engagement Performance Determination

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CONOPS

Measures Of Effectiveness

Opposing Forces

Mission Vignettes

Constructive/Virtual Model

Physical Demonstration

Multi-Peer System Design

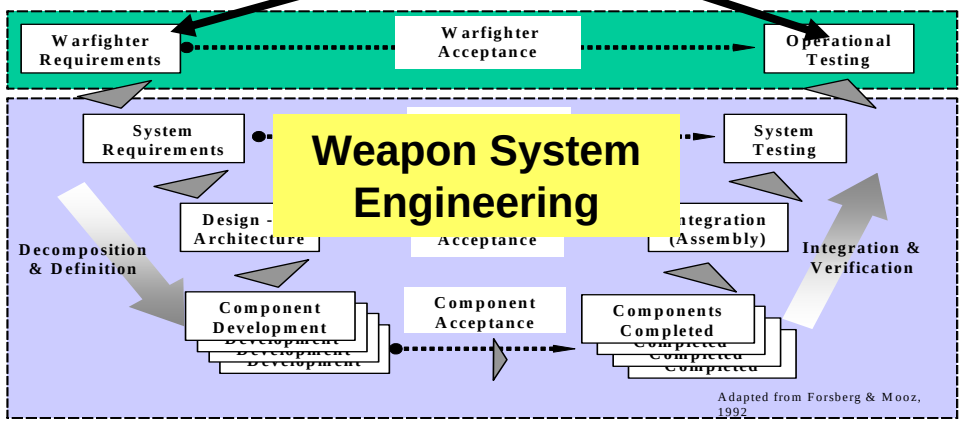
Information Exchange Requirements

Threats Environments

Capability Analysis & Evaluation

Measures Of Performance

Focus on Collaborative Capabilities for Similar Systems!



Desired Net Enabled Practice

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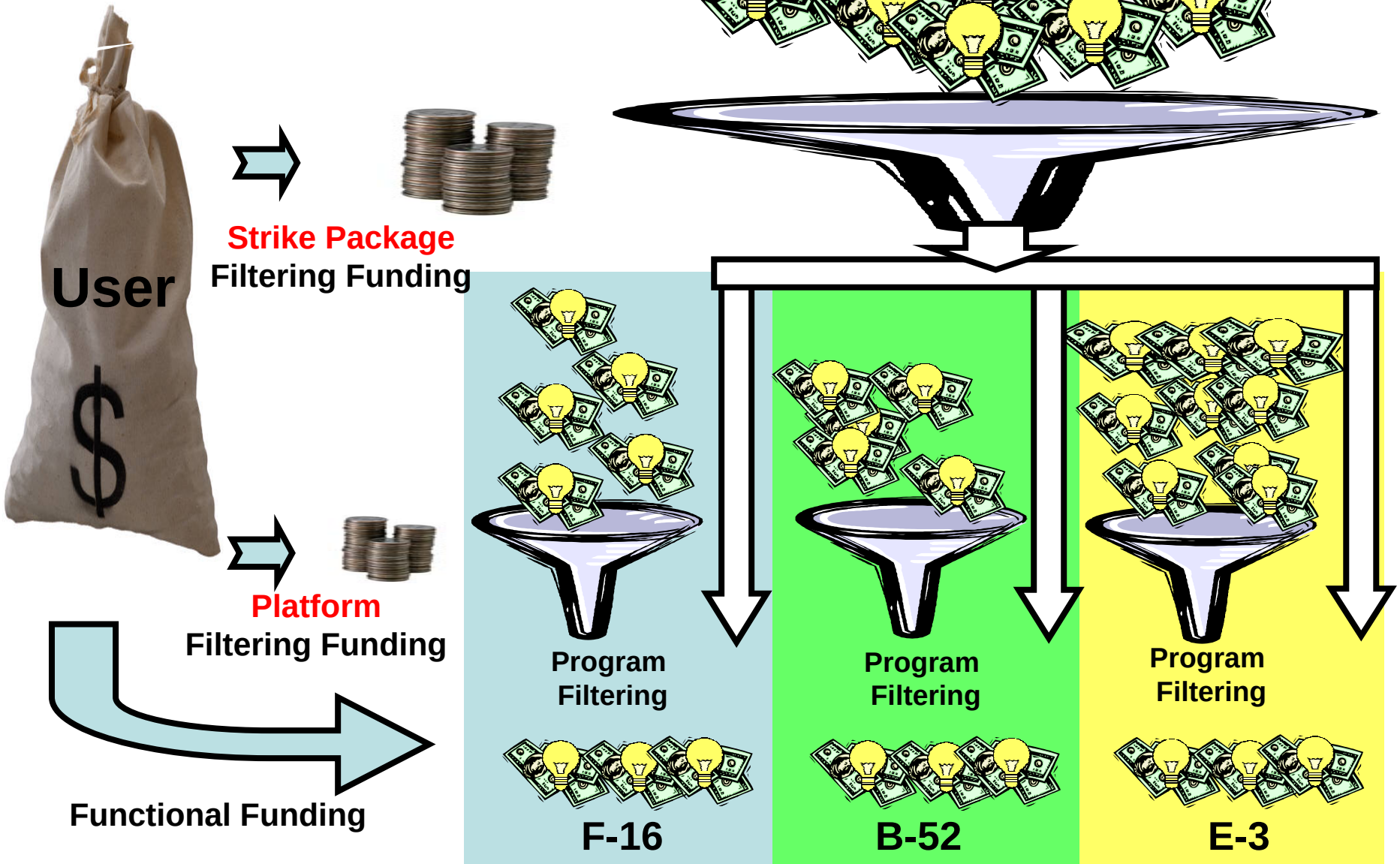

Desired Non-Peer Collaborative Capability Engineering Process

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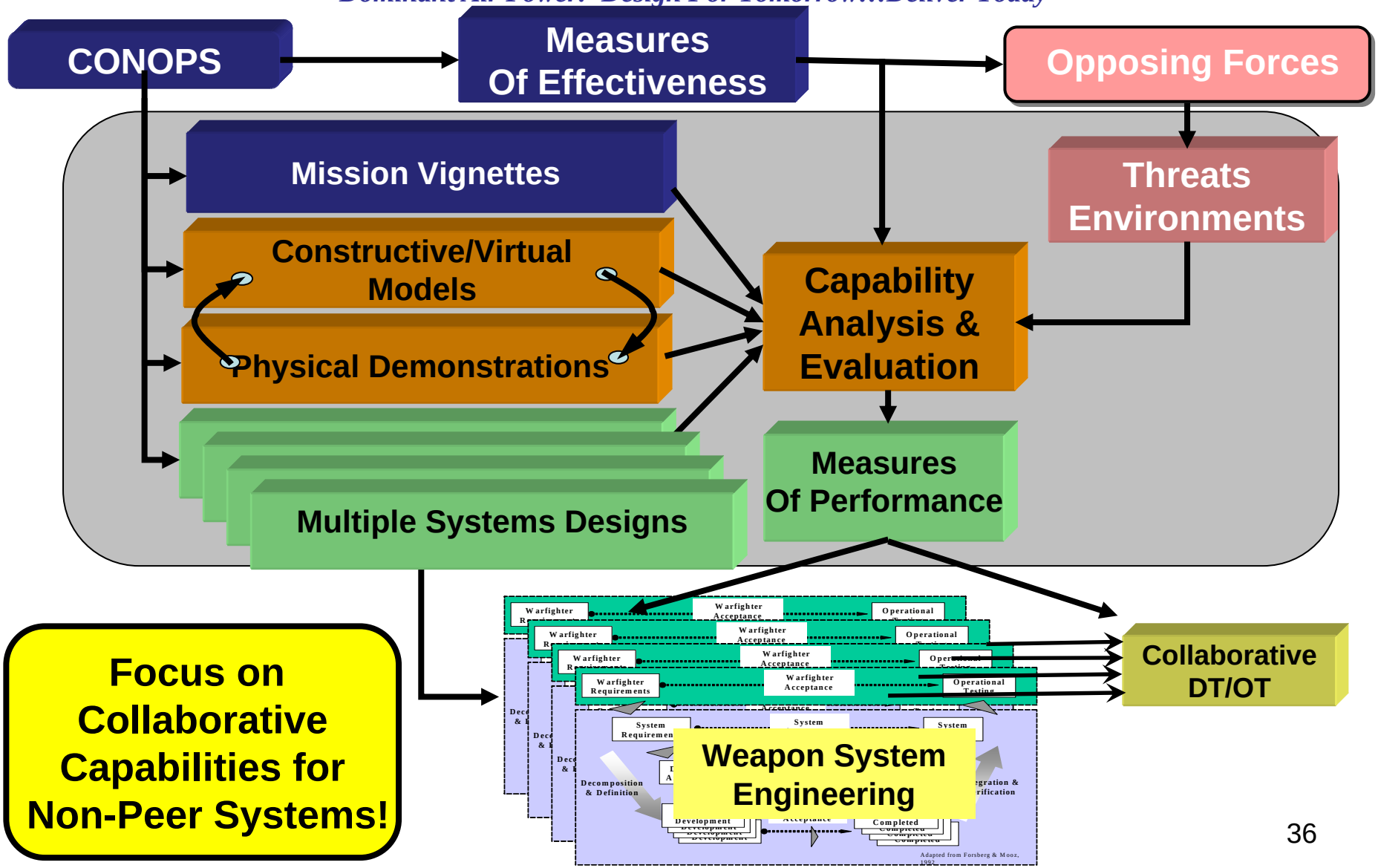

Scenario Baseline – As Executed

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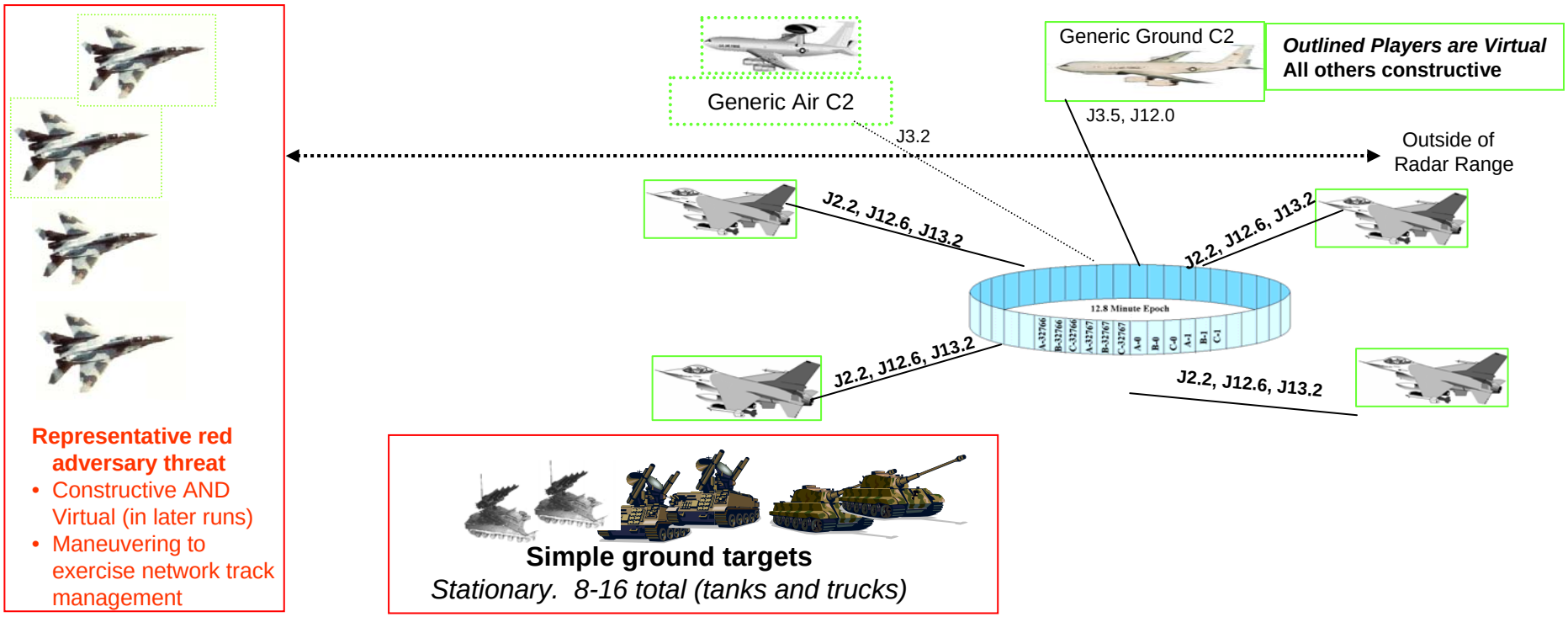

General Scenario Description

- Each flight assigned 1 or 2 ground targets – all F-16s loaded with 4 GBU-31s and 2 AIM-9s
- AWACS detects air threats and begins passing air tracks. Flight leads sort and engage tgts
- V-Stars would build and send ground tracks for all detected ground targets
- V-Stars would build mission assignments (9-line) messages via J12.0 for pop-up targets

Crew Assessments
Link Enablement

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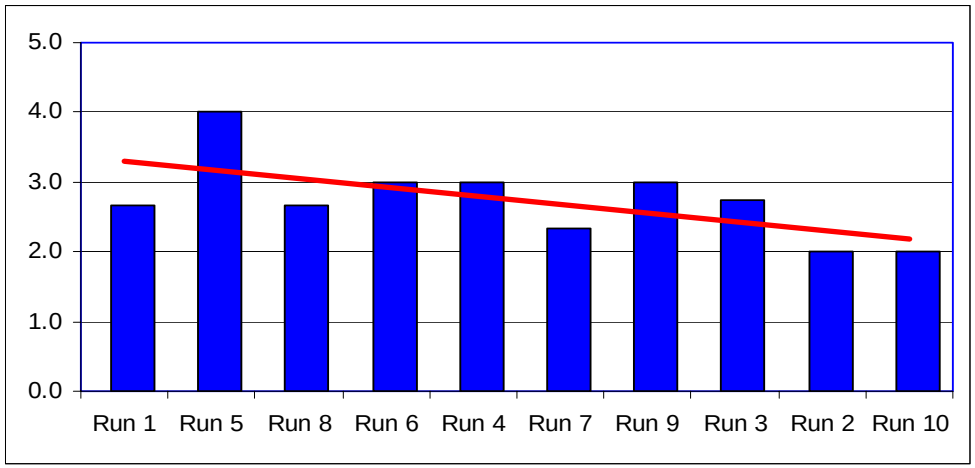
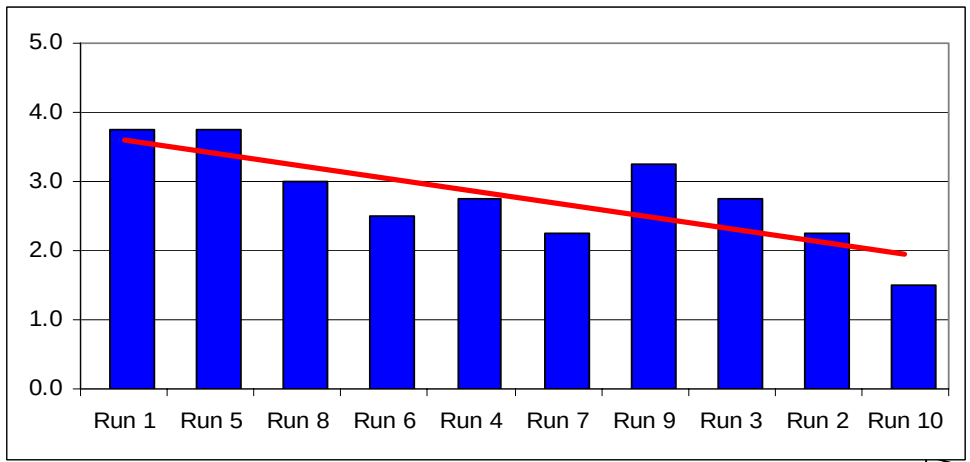
Pilot Assessment Questionnaires

Increasing Value (Higher = Better)



3. Ease of designating multiple targets



4. Ease of sorting airborne targets

High to low bandwidth to voice only

Mission Effectiveness & AN Performance Analysis

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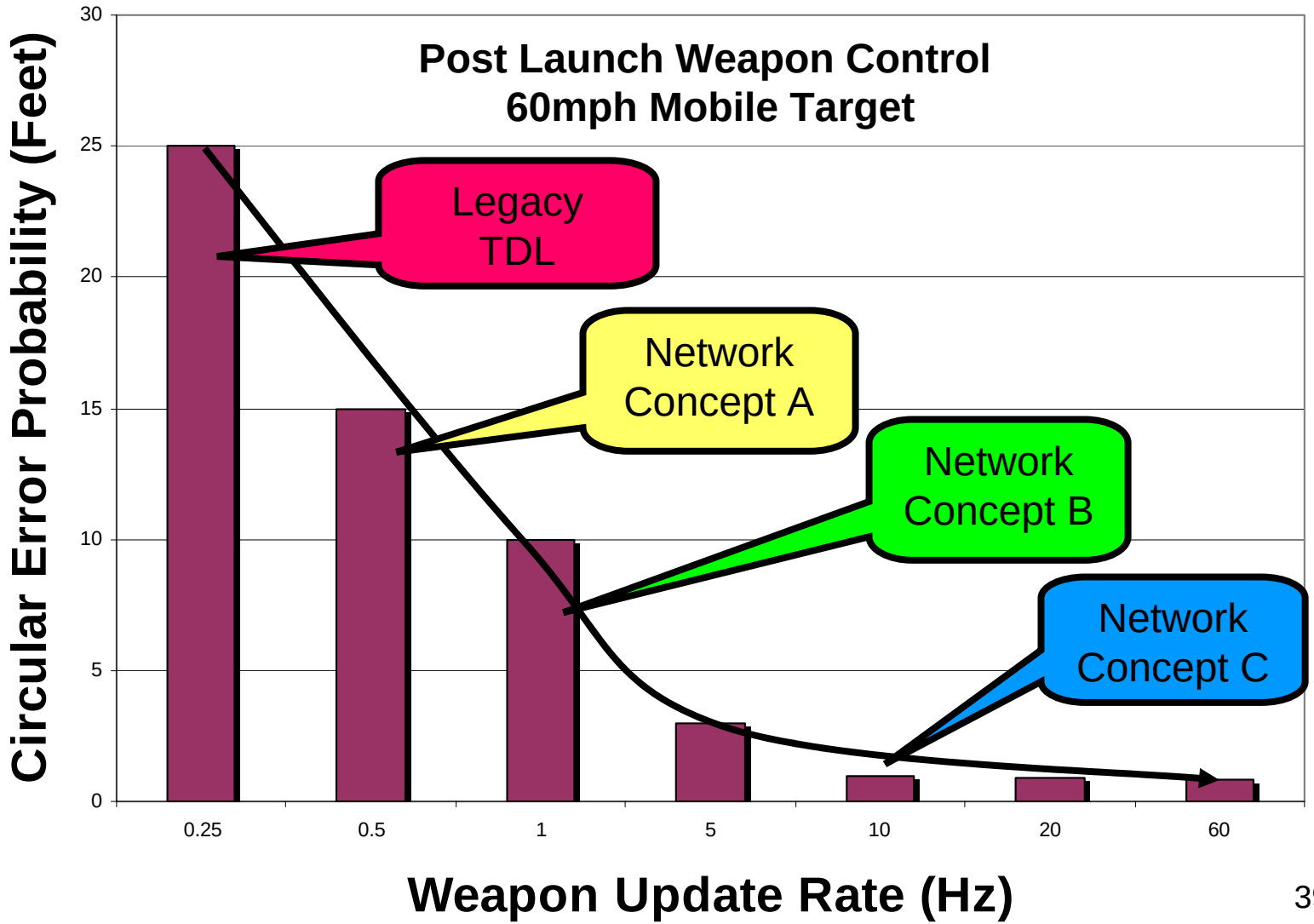

Collaboration Effects on Sorte Timeline

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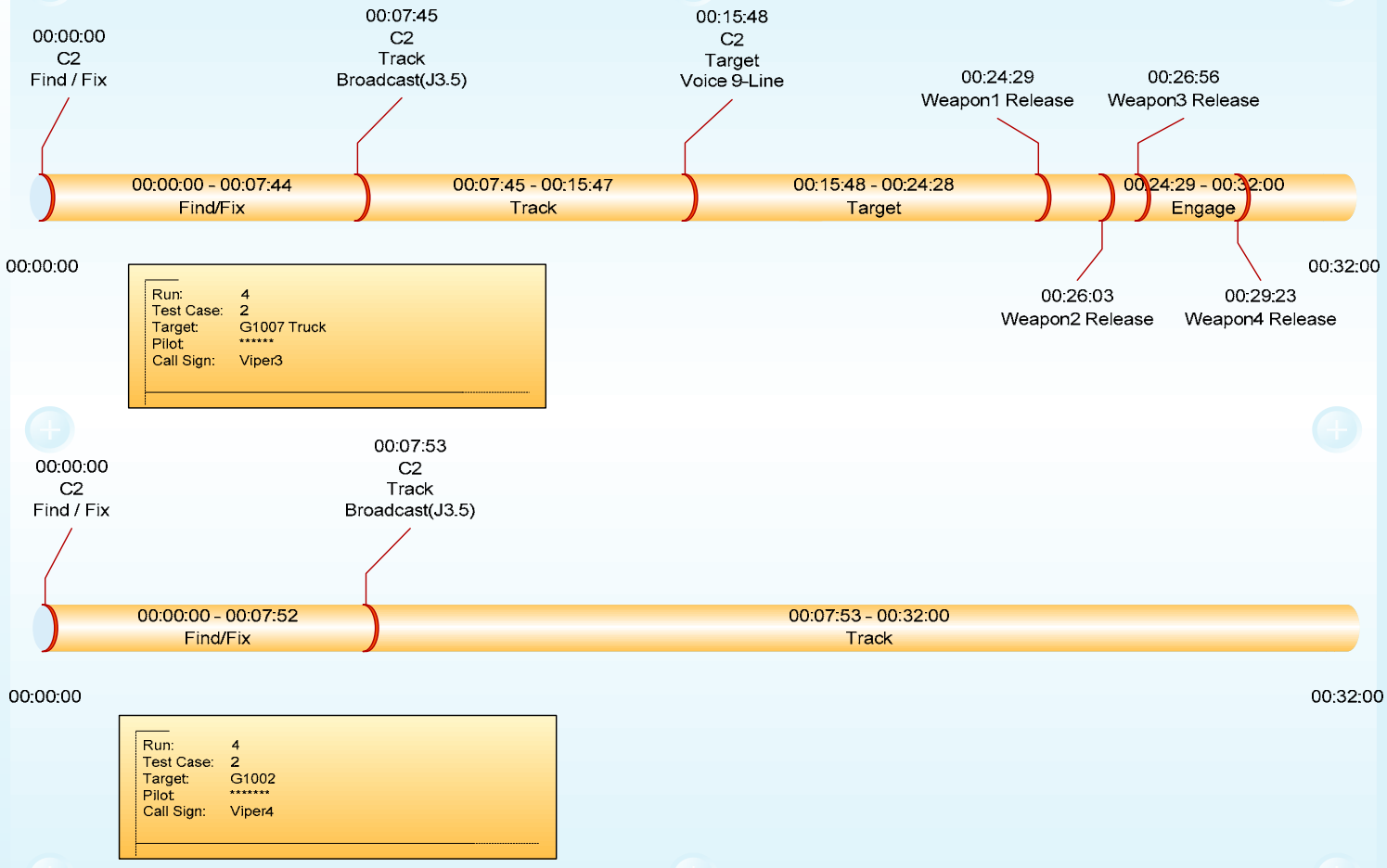
- Run 4 Timeline for Viper 3 and Viper 4



Capability Build History and FY05/06 Funded/Desired Efforts

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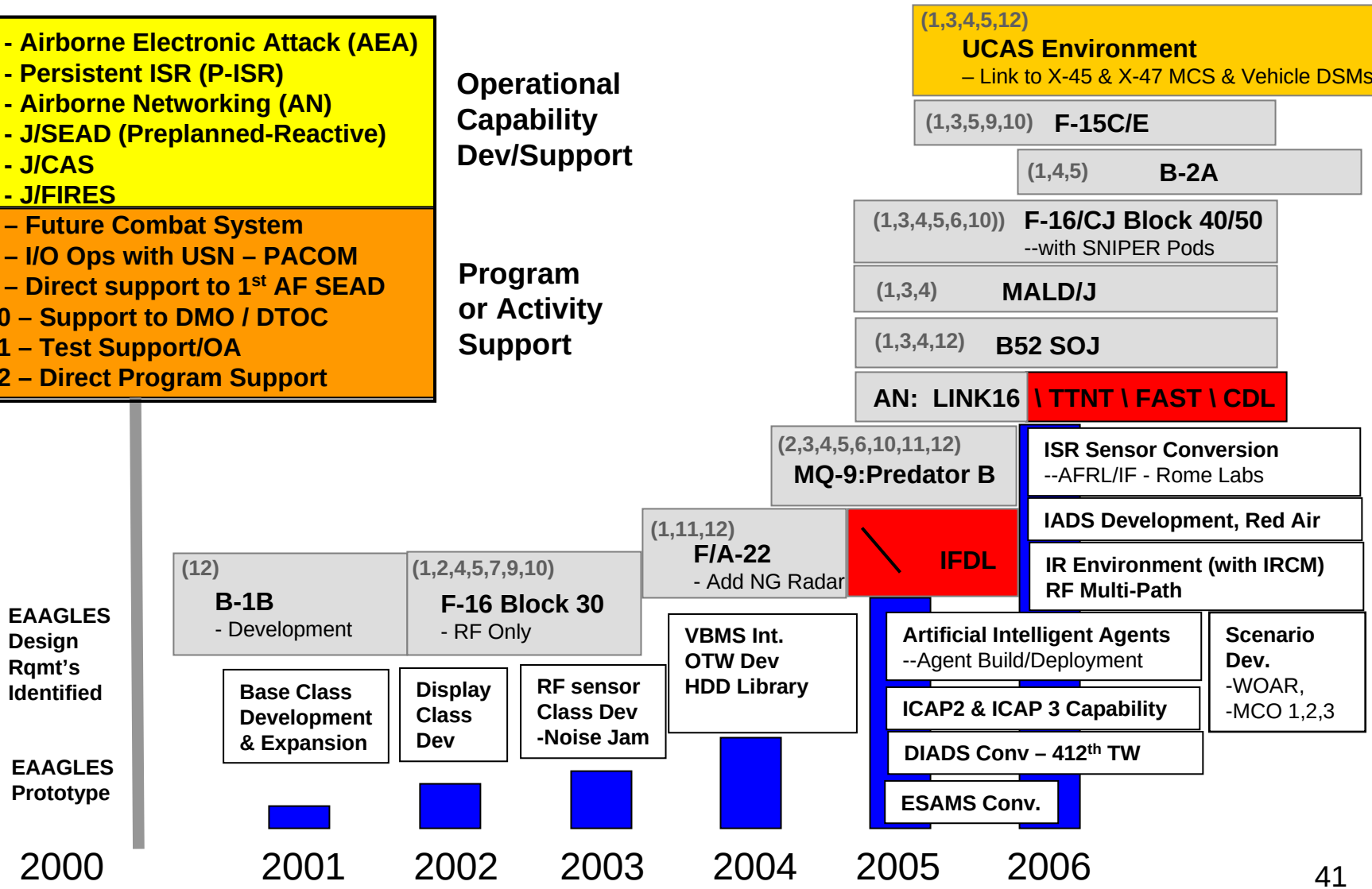
1 - Airborne Electronic Attack (AEA)
2 - Persistent ISR (P-ISR)
3 - Airborne Networking (AN)
4 - J/SEAD (Preplanned-Reactive)
5 - J/CAS
6 - J/FIRES
7 – Future Combat System
8 – I/O Ops with USN – PACOM
9 – Direct support to 1st AF SEAD
10 – Support to DMO / DTOC
11 – Test Support/OA
12 – Direct Program Support



Way Ahead

- **ACC/A8, in conjunction with ASC/DC(A), ESC/DC(A), AFC2ISRC/CC & Navy PEO-T establish a general officer forum to oversee net enabled capability deployment**
  - meet semi-annually
  - Include Navy PEO TACAIR & Army CERDEC for joint capabilities
- **ACC/A8, in conjunction with ASC/DC(A), ESC/DC(A), AFC2ISRC/CC & Navy PEO-T, initiate mission strike package level analysis & filtering process for network enabled concepts**
  - Mission effects oriented
  - Include weapon systems, C2 systems, & network systems
  - Leverage current modeling, simulation & demonstration environments for analysis
- **SAF/XC utilize results of this forum in the Airborne Network General Officer Steering Group (AN GOSG)**